

JPL MLS Team Scientific Publication

Scientific Themes: Convective Processes, Gravity Waves, Tropical Meteorology

Geographical Distribution and Inter-Seasonal Variability of Tropical Deep-Convection: UARS MLS Observations and Analyses

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Summary

In this paper, geographical distributions of sub-tropical stratospheric gravity waves are analyzed using data from the Upper Atmospheric Research Satellite (UARS) Microwave Limb Sounder (MLS). These MLS gravity wave fields are compared to the corresponding maps of MLS humidity and cloudiness as well as NOAA outgoing longwave radiation (OLR) and CMAP rainfall data for different seasons. We found that upward propagating gravity waves generated from these convective regions are shifted poleward by prevailing stratospheric winds. Also, that MLS gravity variances are much stronger when observed on north-looking ascending or south-looking descending orbits; and much weaker when measured on north-looking descending or south-looking ascending orbits. This implies that vertically, a downward propagating wave front must be tilted toward east, in agreement with the numerical model simulations [Goya, 1998, Goya and Miyahara, 1998 and Lane *et al.*, 2001], which show that upward propagating gravity waves generated by convection expand to the fanlike region, but spread horizontally with height facing the background wind.

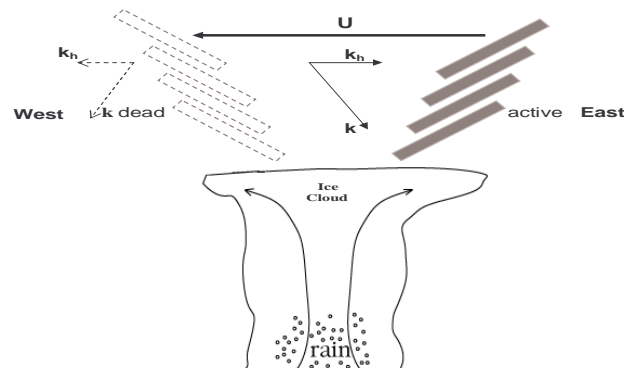


Figure 1: Schematic illustration of gravity waves radiated on top of tropical deep-convection generated ice cloud and rainfalls. MLS observations suggest that only the wave-fronts at “eastern-half” of the convection have horizontal components of the wave vector \mathbf{k}_h opposing to the background wind \mathbf{U} , and thus can propagate upward into the stratosphere.

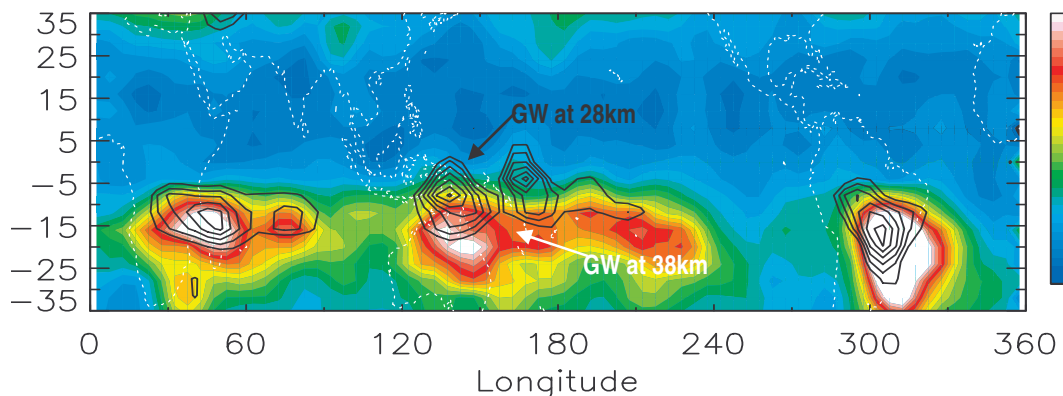


Figure 2: Examples of geographical distributions of MLS observed the stratospheric gravity waves (Dec-Mar/91-94). MLS observation suggest that a probable background wind filtering effect, may shift the convection generated gravity wave poleward when propagating through the stratosphere.